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OHIO STATE UNIVERSITY
BULLETIN

VOLUME XXVI JUNE 17, 1922 NUMBER 22

APPLIED OPTICS

1922-1923

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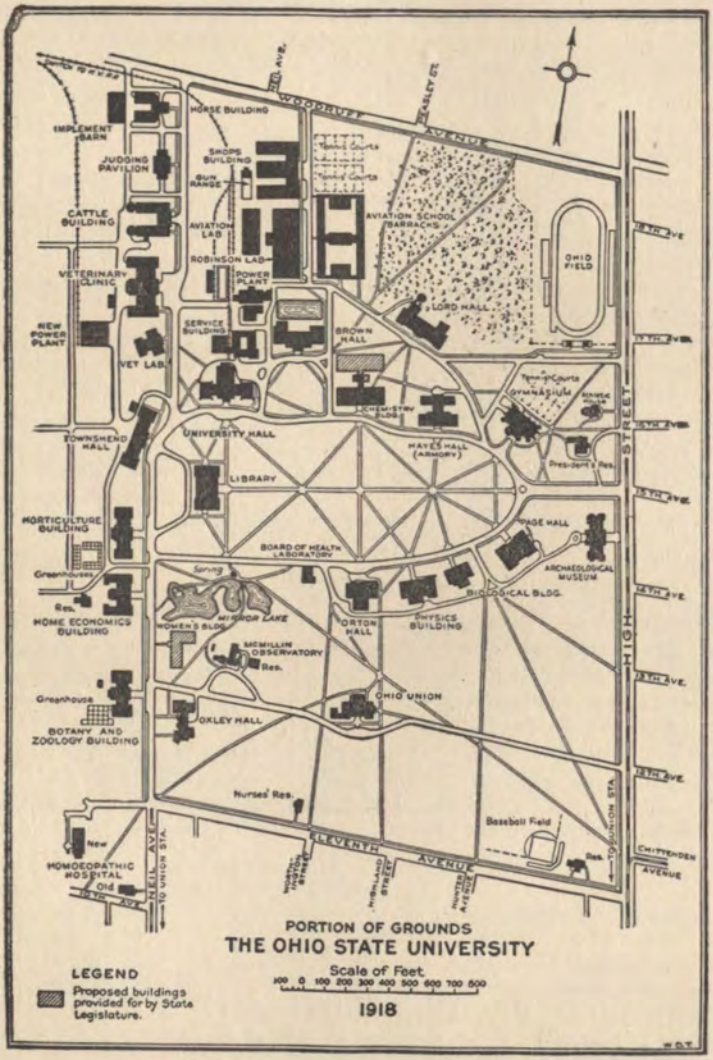
HORSE BUILDING
IMPLEMENT BARN
JUDGING PAVILION
SHOPS BUILDING
GUN RANGE
CATTLE BUILDING
AVIATION LAB.
ROBINSON LAB.
POWER PLANT
VETERINARY CLINIC
NEW POWER PLANT
VET LAB.
SERVICE BUILDING
BROWN HALL
LORD HALL
AVIATION SCHOOL BARRACKS
OHIO FIELD
TOWNSHEND HALL
UNIVERSITY HALL
LIBRARY
HAYES HALL (ARMORY)
HORTICULTURE BUILDING
BOARD OF HEALTH LABORATORY
PAGE HALL
ARCHAEOLOGICAL MUSEUM
BIOLOGICAL BLDG.
HOME ECONOMICS BUILDING
MIRROR LAKE
PHYSICS BUILDING
NORTON HALL
McMILLIN OBSERVATORY
OHIO UNION
BOTANY AND ZOOLOGY BUILDING
OXLEY HALL
Nurses' Res.
Baseball Field
HOMOEOPATHIC HOSPITAL
NEIL AVE.
TO UNION STA.
WOODRUFF AVENUE
EARLY ST.
HIGH STREET
SEVENTH AVENUE
CHITTENDEN AVENUE
PORTION OF GROUNDS
THE OHIO STATE UNIVERSITY
LEGEND
Proposed buildings provided for by State Legislature.
Scale of Feet
1918

UNIVERSITY CALENDAR

1922

AUTUMN QUARTER, Monday, October 2, to Friday, December 22.
Entrance Examinations, Monday to Friday, 8 A. M., September 11 to 15.
Registration Days, Thursday and Friday, September 28 and 29.
Physical Examinations for all new students, Thursday to Friday, September 28 to October 6.
Classes begin Monday, October 2, 8 A. M.
President's Annual Address, Wednesday, October 4, 11 A. M.
Examinations for removal of deficiencies—work reported "conditioned" or "incomplete," Friday and Saturday, October 6 and 7.
Intelligence Tests for all new students, Saturday, October 7.
Latest date for registration of candidates for a degree at the Commencement in June, 1923, October 10.
Thanksgiving Day, Thursday, November 30. No classes.
Autumn Quarter ends Friday, December 22, 6 P. M.

1923

WINTER QUARTER, Tuesday, January 2, to Friday, March 23.
Registration Day, Tuesday, January 2.
Physical Examinations for all new students, Tuesday to Saturday, January 2 to 6.
Classes begin Wednesday, January 3, 8 A. M.
Intelligence Tests for all new students, Saturday, January 6.
University Day, Thursday, February 22. No classes.
Winter Quarter ends Friday, March 23, 6 P. M.

SPRING QUARTER, Monday, March 26, to Friday, June 8.
Registration Day, Saturday, March 24.
Physical Examinations for all new students, Saturday to Saturday, March 24 to 31.
Classes begin Monday, March 26, 8 A. M.
Intelligence Tests for all new students, Saturday, March 31.
Competitive Drill, Cadet Regiments, Saturday, May 19.
Memorial Day, Wednesday, May 30. No classes.
Spring Quarter ends Friday, June 8, 6 P.M.
Alumni Day, Saturday, June 9.
Baccalaureate Sermon, Sunday, June 10.
Class Day, Monday, June 11.
Commencement, Tuesday, June 12, 10 A. M.

CALENDAR FOR 1922

JANUARY.

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CALENDAR FOR 1923

JANUARY.

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NOVEMBER.

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CHARLES F. KETTERING.....Dayton
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Residence: 1873 North High Street—2056

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Office: University Hall (East End)—99332; N. 32
Residence: 1956 Iuka Avenue—5835

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Office: 100 University Hall—99314
Residence: 1348 Neil Avenue—16310

University Examiner.....BLAND L. STRADLEY
Office: 107 University Hall—99353; N. 939
Residence: 318 West Seventh Avenue—N. 10004

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Professor and Director.....HOWARD D. MINCHIN
Office: 206 Physics Building—99324
Residence: 388 West Sixth Avenue—N. 7482

Instructor.....MORGAN C. DAVIES
Residence: 105 East Norwich Avenue—11619

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Professor of Chemistry

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Professor of Physics

CHARLES BRADFIELD MORREY, B.A., M.D.....188 West Tenth Avenue
Professor of Bacteriology

THOMAS EWING FRENCH, M.E.....1778 North High Street
Professor of Engineering Drawing

FRANCIS LEROY LANDACRE, Ph.D.....2026 Iuka Avenue
Professor of Anatomy

WILLIAM LLOYD EVANS, M.Sc., Ph.D.....81 South Champion Avenue
Professor of Chemistry

GEORGE FREDERICK ARPS, A.M., Ph.D.....216 East Lane Avenue
Professor of Psychology

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Professor of Physics

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Professor of Eye, Ear, Nose, and Throat

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Professor of English

ROBERT MEIKLEJOHN, M.E.....419 West Ninth Avenue
Professor of Engineering Drawing

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Assistant Professor of Anatomy

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Assistant Professor of Psychology

RALPH ALBERT KNOUFF, M.A.....10 Thirteenth Avenue
Assistant Professor of Anatomy

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Assistant Professor of Anatomy

DWIGHT AUGUST WOODBURY, M.S.....1183 Grandview Avenue
Instructor in Physics

LEAR HENRY VAN BUSKIRK, B.Sc. in Ch. E., M.D..710 North Park Street
Instructor in Pathology

CHARLES WILLARD JARVIS, M.A.....158 East Northwood Avenue
Instructor in Physics

MORGAN C. DAVIES, Cert. in App. Optics.....105 East Norwich Avenue
Instructor in Applied Optics

ERWIN FOSTER LOWRY, A.M.....2107 Iuka Avenue
Instructor in Physics

HARRY MORTON SAGE, M.D.....65 West Como Avenue
Instructor in Eye, Ear, Nose, and Throat

THE OHIO STATE UNIVERSITY

The Ohio State University is a part of the educational facilities maintained by the State and is located in the northern part of the City of Columbus.

ORGANIZATION

For convenience of administration, the departments of the University are grouped into organizations called colleges. The Ohio State University comprises a graduate school and eleven colleges, each under the administration of a Dean and College Faculty, as follows:

Graduate School
College of Agriculture
College of Arts, Philosophy, and Science
College of Commerce and Journalism
College of Dentistry
College of Education
College of Engineering
College of Homoeopathic Medicine
College of Law
College of Medicine
College of Pharmacy
College of Veterinary Medicine

APPLIED OPTICS

This bulletin is devoted exclusively to the work offered in Applied Optics for the academic year, 1922-1923.

The Department of Applied Optics offers courses designed to prepare students to enter the field of optics. This field includes visual optics; a study of mirrors, lenses, lens design, lens calculation, and design of optical instruments; spectroscopy.

The courses in visual optics are outlined from the standpoint that the visual properties of the eye are intimately related to all branches of applied optics and also with the view of preparing students to detect and correct the errors of the eye by the use of lenses.

Provision is made for clinical practice in both the refraction and the pathological fields and for practice in the mechanical laboratory.

The courses in general science and mathematics form a basis for the study of theoretical optics and the application of optical principles.

NOTE—University bulletins may be obtained by addressing the University Examiner, The Ohio State University, Columbus, Ohio, and stating the college in which the writer is interested.

ADMISSION

THE ENTRANCE BOARD

The admission of students is in charge of the University Entrance Board, which determines the credits that shall be issued on all entrance examinations and certificates. Correspondence relative to admission should be addressed to the University Examiner, The Ohio State University, Columbus, Ohio.

ENTRANCE BY DIPLOMA OR EQUIVALENTS

The following persons are eligible to admission without examinations or conditions:

(1) The holder of a diploma from a first-class high school in the State of Ohio.

(2) The holder of a properly endorsed certificate from such secondary schools as have been accredited or recognized by the University.

(3) The holder of a 60 count Regents' Certificate of the State of New York.

(4) The holder of 15 credit units as determined by the Entrance Board.

DISTRIBUTION OF UNITS

Of these fifteen units, not less than three shall be in English; one in American history and civics; one in algebra; one in geometry; four in foreign language; one in physics or chemistry; one in botany, zoology, or physiology; and three shall be elective.

ENTRANCE BY EXAMINATION

Deficiencies in requirements for entrance may be removed by examinations given by the University during the months of September and June.

Students over twenty-one years of age may be admitted upon satisfactory evidence that they can successfully pursue the work elected. No degree will be granted unless the full entrance requirements have been fulfilled.

For further information, see the **Bulletin of General Information**, which may be obtained on application to the University Examiner.

It is urged that students who desire to enter the University put themselves in communication with the University Examiner at as early a date as possible.

REGISTRATION

Admission to the University must be secured before registration can be accomplished. Registration consists of the following steps in the order indicated: (1) the securing of a class-card from the Director of the Courses in Applied Optics (office, Physics Building, room 206), (2) the securing of a fee-card from the office of the Registrar, and (3) the payment of the fees at the office of the Bursar.

DEGREE

Upon the satisfactory completion of the four-year curriculum, or what is deemed to be its equivalent, a student will receive the degree of Bachelor of Science in Applied Optics.

EQUIPMENT

The courses are thoroughly equipped with the modern and best forms of optical apparatus. The clinic is provided with schematic eyes with pathological slides, C. & I. ophthalmometer, Universal ophthalmometer, Hardy ophthalmometer with corneal microscope, several DeZeng phorometers, a Wolff skioptometer with batteries of spheres and cylinders, various pieces of muscle-testing apparatus, several self-luminous retinoscopes and ophthalmoscopes, a Geneva combined retinoscope and ophthalmoscope, a perimeter, a Rogers dioptrometer, interpupillary gauge, vertex dioptrometer, trial cases, Hertel keratometer, Stevens tropometer, Stevens clinoscope and all the best forms of modern ophthalmic apparatus suitable for refractive and ophthalmic lens purposes. The mechanical laboratory is fully equipped to grind, surface, edge, and mount lenses.

CLINICAL FACILITIES

The clinical laboratory has been enlarged and new equipment added during the present year.

Clinics are open to the students and members of the instructional force in particular and to outsiders upon application. They are conducted every afternoon during the week. These clinics furnish an endless variety of ocular conditions for the inspection and investigation of the students in these courses. Students make the examinations under the supervision of the director of the clinic. These clinics have served between five and six hundred persons each year during the period of their existence. Difficult cases form the basis for a subsequent discussion of methods of examination employed and the interpretation of the data obtained.

FEES AND EXPENSES

GENERAL CHARGES

All University fees must be paid at the opening of each Quarter as a condition of admission to classes. All registration fees including laboratory deposits are assessed in the office of the Registrar and are paid in the office of the Bursar. Registration is not complete until all fees have been paid. No student will have any privilege in the classes or laboratories until all fees and deposits are paid.

Since all fees are due and payable as a part of the student's registration, no person should come to the University for registration without money sufficient to cover all of his fees and deposits.

Matriculation Fee. Every student upon his first admission to the University is required to pay a matriculation fee of $10.00. This fee is

paid but once, and is in addition to other University fees, and entitles the student to the privileges of membership in the University.

Non-Resident Fee. Every undergraduate student who is not a legal resident of the State of Ohio is required to pay a non-resident fee of $35.00 each Quarter of his residence in the University in addition to other University fees. The burden of registering under proper residence is placed upon the student. If there is any possible question of his right to legal residence, the matter should be brought to the attention of the Registrar and passed upon, previous to registration or the payment of fees. Any student who registers improperly under this rule shall be required to pay not only the non-resident fee, but shall be assessed a penalty of $10.00.

Students who do not pay this fee within thirty days after they have been notified that the non-resident fee has been assessed against them, will have their registration in the University canceled.

No person shall be considered eligible to register in the University as a resident of the State of Ohio unless he has been a bona fide resident in the State twelve consecutive months next preceding the date of his original enrollment; and no person shall be considered to have gained or lost a residence in this State for the purpose of registering in the University by any conduct of his own while he is a student in the University; but persons whose legal residence follows that of other persons, as hereinafter provided, shall be considered to have gained or lost legal residence in this State for such purpose while students in the University according to changes of legal residence of such other persons, except that such legal residence shall not be considered to be so gained until twelve months after such other person becomes a legal resident of this State.

The residence of minors shall follow that of the legal guardian, regardless of emancipation; but in case a resident of Ohio is appointed guardian of a non-resident minor, the legal residence of such minor for the purpose of this rule shall not be considered to be established in the State of Ohio until the expiration of twelve months after such appointment.

The residence of wives shall follow that of husbands.

Aliens who have taken out first citizenship papers and who have been residents of Ohio for twelve months next preceding the date of their enrollment in the University, shall be regarded as eligible for registration as residents of Ohio.

TUITION

First and Second Years. The tuition fee is $15.00 each Quarter.

Third and Fourth Years. The tuition fee is $35.00 each Quarter. The total tuition fees for the four years aggregate $300.00.

Special Students or others who take the courses of the third and fourth years, or any portion thereof, shall pay a fee of $35.00 each Quarter.

Laboratory Deposits. Students are required to pay for all materials consumed in laboratory work during the first and second years. A cash deposit is required in each course requiring such materials; the unexpended balance is returned at the end of the Quarter.

OTHER EXPENSES

The Ohio Union. A fee of one dollar a Quarter is paid by all male students at registration. This entitles the student to all the privileges of the Union consistent with the Constitution and House Rules governing it.

Graduation Fee. A fee of five dollars to cover expense of graduation and diploma is required of each person receiving one of the ordinary degrees from the University, and this fee must be paid to the Bursar of the University before the degree is conferred. A like fee of ten dollars is charged each person receiving one of the higher graduate degrees.

Rooms and Board. Furnished rooms can be obtained at prices varying from ten to fifteen dollars a month. Board at the restaurants and boarding clubs near the University costs from six and one-half to eight dollars a week. Board, with furnished rooms, can be obtained in private families at rates varying around ten dollars a week.

Board can be secured at the Ohio Union Commons at reasonable rates.

Textbooks. Students should not purchase textbooks until they are advised by the instructors of their respective classes.

COST OF A YEAR'S WORK

One of the most perplexing questions that confronts a prospective student is what the course is going to cost him a year.

In order to furnish information, we have listed below an estimate of the average payments required by the University for the Freshman year, and have estimated the cost of room and boarding at a safe price. These two items are sometimes reduced slightly where two students occupy the same room and where boarding clubs are economically managed. Fees to the University are paid at the beginning of each Quarter.

Matriculation Fee	$ 10 00
Incidental Fee	45 00
Ohio Union	3 00
Deposits to cover laboratory materials and breakage	30 00
Books	30 00
Board—36 weeks at $8.00 a week	288 00
Room Rent, at $15.00 a month	135 00
General expenses	100 00
	$641 00

The item of general expenses is always subject to the personal habits of the individual and varies according to the degree of economy exercised.

In order to meet all the necessary expenses of registration, books, and other expenditures incident to securing a room and board, a student should come prepared to expend from $100.00 to $125.00 during the first ten days of a Quarter. After that period his board and room rent will constitute the major part of his expenses.

INFORMATION

For further information as to entrance requirements, etc., address the University Examiner. Correspondence is also invited by Howard D. Minchin, Professor of Applied Optics, who will be in his office (Physics Building, room 206) from 9 to 11 a. m., after September 25th.

CURRICULUM

LEADING TO THE DEGREE, BACHELOR OF SCIENCE IN APPLIED OPTICS

FIRST YEAR

AUTUMN QUARTER	WINTER QUARTER	SPRING QUARTER
Chemistry.....(401 or 411) 5 Elementary or General	Chemistry.....(402 or 412) 5 Elementary or General	Chemistry.....(403 or 413) 5 Qualitative Analysis
Anatomy.....(431) 4 Human Anatomy	Anatomy.....(432) 4 Human Anatomy	Anatomy.....(433) 5 Human Anatomy
Anatomy.....(434) 3 Histology	Anatomy.....(435) 3 Histology	Anatomy.....(436) 4 Histology
English.....(401) 5	Engr. Drawing.....(418) 3 Elementary Drawing	Engr. Drawing.....(419) 4 Technical Drawing

SECOND YEAR

Physics.....(401 or 403) 5 General	Physics.....(402 or 404) 5 General	Bacteriology.....(450) 5
Physiology.....(403) 5	Physiology.....(404) 5	Psychology.....(401) 5 Elementary
Mathematics.....(421) 5 Elementary Analysis	Mathematics.....(422) 5 Elementary Analysis	Elective..... 4
Pathology.....(450) 3	Pathology.....(451) 3	

THIRD YEAR

Applied Optics.....(401) 5 Theoretical Optics	Psychology.....(402) 5 Elementary	Anatomy.....(437) 5 The Eye
Applied Optics.....(411) 4 Vision Optics	Applied Optics.....(402) 5 Theoretical Optics	Applied Optics.....(403) 5 Theoretical Optics
Physiology.....(440) 3 Physiology of the Eye	Applied Optics.....(412) 4 Vision Optics	Applied Optics.....(413) 4 Vision Optics
Elective..... 4	Elective..... 2	Elective..... 2

FOURTH YEAR

AUTUMN QUARTER		WINTER QUARTER		SPRING QUARTER	
Applied Optics.....(441)	5	Applied Optics.....(442)	5	Applied Optics.....(443)	5
Clinical Laboratory Practice		Clinical Laboratory Practice		Clinical Laboratory Practice	
Applied Optics.....(421)	3	Applied Optics.....(422)	3	Applied Optics.....(423)	3
Theoretical Applied Optics		Theoretical Applied Optics		Theoretical Applied Optics	
Applied Optics.....(431)	2	Applied Optics.....(432)	2	Applied Optics.....(433)	2
Mechanical Optics		Mechanical Optics		Mechanical Optics	
Pathology.....(460)	3	Pathology.....(461)	3	Elective.....	5
Pathology of the Eye		Pathology of the Eye			
Elective.....	3	Elective.....	3		

All electives shall be subject to the approval of the Professor of Applied Optics.

DEPARTMENTS OF INSTRUCTION

ANATOMY

Office, 105 Biological Building

PROFESSOR LANDACRE, ASSISTANT PROFESSORS BUCK, BAKER, AND KNOUFF, AND DEPARTMENT ASSISTANTS

431. Human Anatomy. Four credit hours. Autumn Quarter. One recitation and nine laboratory hours each week. Required. Mr. Baker.

The gross anatomy of the abdomen and leg including the osteology of these parts.

This course is not open to students who have credit for Anatomy 125.

432. Human Anatomy. Four credit hours. Winter Quarter. One recitation and nine laboratory hours each week. Required. Prerequisite, Anatomy 431. Mr. Baker.

The gross anatomy of the thorax and arm including the osteology of these parts.

This course is not open to students who have credit for Anatomy 125 and 126.

433. Human Anatomy. Five credit hours. Spring Quarter. Two recitations and ten laboratory hours each week. Required. Prerequisite, Anatomy 432. Mr. Baker.

The gross anatomy of the head and neck including the osteology of these parts and the applied anatomy.

This course is not open to students who have credit for Anatomy 126 and 131.

434. Histology. Three credit hours. Autumn Quarter. One recitation and four laboratory hours each week. Required. Mr. Knouff.

The general histology of the tissues and the special histology of the skeleton and vascular systems.

This course is not open to students who have credit for Anatomy 139.

435. Histology. Three credit hours. Winter Quarter. One recitation and four laboratory hours each week. Required. Prerequisite, Anatomy 434. Mr. Knouff.

The special histology of the digestive, respiratory, urinary, and nervous systems.

This course is not open to students who have credit for Anatomy 139 and 140.

436. Histology and Embryology. Four credit hours. Spring Quarter. Two recitations and four laboratory hours each week. Required. Prerequisite, Anatomy 435. Mr. Knouff.

The histology of the reproductive system, the general embryology of the vertebrate body with special reference to the development of teeth and pharyngeal derivatives.

This course is not open to students who have credit for Anatomy 140 and 141.

437. The Eye. Four credit hours. Spring Quarter. One recitation and six laboratory hours each week. Required. Prerequisite, Anatomy 431-432-433 and 434-435-436.

The gross anatomy of the orbit and eye in the shark, sheep, and man with a review of the embryology and histology of the organ of vision.

This course is not open to students who have credit for Anatomy 145.

APPLIED OPTICS

Office, 206 Physics Building

PROFESSOR MINCHIN, MR. DAVIES

401. Theoretical Optics. Five credit hours. Autumn Quarter. Four hours lecture and quiz and one laboratory period each week. Required. Prerequisites, Physics 401-402 or 403-404 and Mathematics 421-422. Mr. Minchin.

Subject matter—The fundamental principles of light, refractive indices, prisms, thin lenses, and cylindrical lenses.

This course is not open to students who have credit for Applied Optics 107 and 108.

402. Theoretical Optics. Five credit hours. Winter Quarter. Four hours lecture and quiz and one laboratory period each week. Required. Prerequisite, Applied Optics 401. Mr. Minchin.

Subject matter—Combinations of thin lenses and thin lens systems. Thick lenses, effectivity and back focal length, vertex refraction.

403. Theoretical Optics. Five credit hours. Spring Quarter. Four hours lecture and quiz and one laboratory period each week. Required. Prerequisite, Applied Optics 402. Mr. Minchin.

Subject matter—Lens systems, optical instruments, chromatic aberration, spherical aberration, diffraction, interference, polarization, and spectra.

411. Vision Optics. Four credit hours. Autumn Quarter. Lectures and quiz. Required. Prerequisites, Anatomy 431, 432, 433, 434, 435, 436, 437, Pathology 435, Physics 401-402 or 403-404, and Mathematics 421-422. Mr. Davies.

Recitations, lectures, and demonstrations dealing with the principles of refraction in the human eye based on the laws of conjugate foci; hyperopia, myopia, and astigmatism; ophthalmoscopy and the fundamentals of vision.

This course is not open to students who have credit for Applied Optics 115 and 116.

412. Vision Optics. Four credit hours. Winter Quarter. Lectures and quiz. Required. Prerequisite, Applied Optics 411. Mr. Davies.

Lectures and demonstrations of clinical methods of refraction, their theory and practical application. The conjugate foci theory of mirror fundus reflexes. Keratometry and other methods of objective and subjective eye examination.

413. Vision Optics. Four credit hours. Spring Quarter. Lectures and quiz. Required. Prerequisite, Applied Optics 412. Mr. Davies.

Lectures and demonstrations on accommodation, convergence, coordination of the visual functions, retinal images and ocular calculations. Visual field work, ocular calisthenics, heterophoria and squint. Differential determination of ocular abnormalities.

421. Theoretical Applied Optics. Three credit hours. Autumn Quarter. Lectures and quiz. Required. Prerequisites, Applied Optics 401-402-403 and 411-412-413. Mr. Minchin.

Lectures, demonstrations, and quiz on the optical constants of the eye. Mathematical and physical methods of calculations applied to the correction of anomalies of the eye. Monocular and binocular vision.

This course is not open to students who have credit for Applied Optics 133-134.

422. Theoretical Applied Optics. Three credit hours. Winter Quarter. Lectures and quiz. Required. Prerequisite, Applied Optics 421. Mr. Minchin.

Subject matter—Functions of the retina, light sense, form sense, and color sense. Perception of depth, optical illusions.

423. Theoretical Applied Optics. Three credit hours. Spring Quarter. Lectures and quiz. Required. Prerequisite, Applied Optics 422. Mr. Minchin.

Subject matter—Optical instruments—their design, construction, and application. Study of spectra and vision.

In courses 421-422-423 the fundamental principles of physiological optics will be thoroughly covered.

431. Mechanical Optics. Two credit hours. Autumn Quarter. One lecture and two laboratory hours each week. Required. Prerequisites, Applied Optics 401-402-403 and 411-412-413. Mr. Davies.

Lens centering, axis marking, use of lens measure. Surface grinding and polishing. Marking rough and semifinished bifocals.

This course is not open to students who have credit for Applied Optics 110 and 129.

432. Mechanical Optics. Two credit hours. Winter Quarter. One lecture and two laboratory hours each week. Required. Prerequisite, Applied Optics 431. Mr. Davies.

Lens sizing, cutting, edging, both hand and automatic. A study of systems of spectacle and eye glass mountings. Soldering.

433. Mechanical Optics. Two credit hours. Spring Quarter. One lecture and two laboratory hours each week. Required. Prerequisite, Applied Optics 432. Mr. Davies.

Face measurements, mounting and adjusting frames. Truing, bridge bending. Prescription writing and reading. Fitting of bifocal lenses.

441. Clinical Laboratory Practice. Five credit hours. Autumn Quarter. One conference and five two-hour laboratory periods each week. Required. Prerequisites, Applied Optics 401-402-403 and 411-412-413. Mr. Davies.

Four laboratory periods will be given each week to making examinations in the clinic laboratory.

The conference hour will be given to a discussion and study of cases coming up in the practice.

One laboratory period each week will be given to work in the hospital under the direction of Dr. Ferree and Dr. Sage.

This course is not open to students who have credit for Applied Optics 147-148.

442. Clinical Laboratory Practice. Five credit hours. Winter Quarter. One conference and five two-hour laboratory periods each week. Required. Prerequisite, Applied Optics 441. Mr. Davies.

A continuation of Applied Optics 441.

443. Clinical Laboratory Practice. Five credit hours. Spring Quarter. One conference and five two-hour laboratory periods each week. Required. Prerequisite, Applied Optics 442. Mr. Davies.

A continuation of Applied Optics 442.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

601. Advanced Applied Optics. Four credit hours. Autumn Quarter. Lectures and laboratory work. Prerequisites, Applied Optics 401-402-403 and Mathematics 441-442-443. Mr. Minchin.

Theory and application of optical instruments used in practice. A discussion of thick lenses involved in such instruments.

Illumination and vision and color and color vision. The principles of physiological optics.

This course is not open to students who have credit for Applied Optics 151-152.

602. Advanced Applied Optics. Four credit hours. Winter Quarter. Lectures and laboratory work. Prerequisite, Applied Optics 601. Mr. Minchin.

A continuation of Applied Optics 601.

603. Advanced Applied Optics. Four credit hours. Spring Quarter. Lectures and laboratory work. Prerequisite, Applied Optics 602. Mr. Minchin.

A continuation of Applied Optics 602.

BACTERIOLOGY

Office, 202 Veterinary Laboratory Building

PROFESSOR MORREY, MR. SPEER, AND DEPARTMENT ASSISTANTS

450. Bacteriology. Five credit hours. Spring Quarter. Two class periods and three three-hour laboratory periods each week. Required. Dr. Speer and assistant.

The study of bacteria with reference to morphology, staining growth on culture media, effect of physical and chemical environment, action on their food material. Principles of disinfection and sterilization. Some of the pathogenic organisms of the mouth cavity and of the eye are studied.

This course is not open to students who have credit for Bacteriology 150.

CHEMISTRY

Office, 100 Chemistry Building

PROFESSORS McPHERSON AND EVANS, AND DEPARTMENT ASSISTANTS

401. Elementary Chemistry. Five credit hours. One Quarter. Autumn and Winter. One lecture, one recitation, and six laboratory hours each week. This course or Chemistry 411 required. Mr. Evans, Mr. Haskins, and department assistants.

A general course in the chemistry of the non-metals. This course should be followed by Chemistry 402.

This course is not open to students who have credit for Chemistry 105.

402. Elementary Chemistry. Five credit hours. One Quarter. Winter and Spring. One lecture, one recitation, and six laboratory hours each week. This course or Chemistry 412 required. Prerequisite, Chemistry 401. Mr. Evans, Mr. Martin, and department assistants.

A continuation of the study of the non-metals and a survey of the chemistry of the metals. This course should be followed by Chemistry 403.

This course is not open to students who have credit for Chemistry 105-106.

403. Qualitative Analysis. Five credit hours. Spring Quarter. One lecture, one recitation, and six laboratory hours each week. This course or Chemistry 413 required. Prerequisite, Chemistry 402. Mr. Evans, Mr. Looker, and department assistants.

A brief course in the systematic detection and separation of the metals and acids.

This course is not open to students who have credit for Chemistry 110.

411. General Chemistry. Five credit hours. One Quarter. Autumn and Winter. One lecture, one recitation, and six laboratory hours each week. This course or Chemistry 401 required. Prerequisite, an acceptable course in high-school chemistry. Mr. Evans, Mr. Martin, and department assistants.

A general course on the chemistry of the non-metals. It is more advanced than Chemistry 401. Students taking this course will follow it with Chemistry 412.

This course is not open to students who have credit for Chemistry 109.

412. General Chemistry. Five credit hours. One Quarter. Winter and Spring. One lecture, one recitation, and six laboratory hours each week. This course or Chemistry 402 required. Prerequisite, Chemistry 411. Mr. Evans, Mr. Looker, and department assistants.

A continuation of Chemistry 411, followed by a treatment of the chemistry of the metals. This course should be followed by Chemistry 413.

This course is not open to students who have credit for Chemistry 109-110.

413. Qualitative Analysis. Five credit hours. Spring Quarter. One lecture, one recitation, and six laboratory hours each week. This course or Chemistry 403 required. Prerequisite, Chemistry 412. Mr. Evans, Mr. Haskins, and department assistants.

A general course in qualitative analysis, dealing with the systematic separation and identification of the metals and acids. This course deals with the applications of the ionization theory, mass action law, and the principles of chemical equilibrium to qualitative analysis.

ENGINEERING DRAWING

Office, 204 Brown Hall

PROFESSORS FRENCH AND MEIKLEJOHN, AND DEPARTMENT ASSISTANTS

418. Elementary Drawing. Three credit hours. Winter Quarter. One lecture and six laboratory hours each week. Required.

Geometrical drawing, orthographic projection, lettering.

419. Technical Drawing. Four credit hours. Spring Quarter. One lecture and nine laboratory hours each week. Required. Prerequisite, Engineering Drawing 418.

Applied geometry, technical sketching and drawing, design of lenses, optical instruments and optical appliances.

ENGLISH

Office, 103 Physics Building

PROFESSORS DENNEY AND BECK, AND DEPARTMENT ASSISTANTS

401. Paragraph Writing. Five credit hours. One Quarter. Summer, Autumn, Winter, Spring. Five hours of recitation, quiz, reading, and practice. Required. No prerequisite. All instructors.

This course is not open to students who have credit for English 101-104.

MATHEMATICS

Office, 314 University Hall

PROFESSOR RASOR, ASSOCIATE PROFESSOR ARNOLD

421. Elementary Analysis. Five credit hours. Autumn Quarter. Five recitations each week. Required. Mr. Arnold.

This course is not open to students who have credit for Mathematics 121-122.

422. Elementary Analysis. Five credit hours. Winter Quarter. Five recitations each week. Required. Prerequisite, Mathematics 421. Mr. Arnold.

423. Elementary Analysis. Five credit hours. Spring Quarter. Five recitations each week. Elective. Prerequisite, Mathematics 422. Mr. Arnold.

Students who have one and one-half units of mathematics for entrance to the University may elect Mathematics 431-432-433 in place of 421-422-423.

PATHOLOGY

Office, 710 North Park Street

PROFESSOR SCOTT, MR. VAN BUSKIRK

450. Pathology. Three credit hours. Autumn Quarter. One lecture and six laboratory hours each week. Required. Prerequisites, Anatomy 431, 432, 433 and 434, 435, 436. Mr. Scott, Mr. Van Buskirk.

General pathology, including the etiology of diseases, disturbances of nutrition, inflammation and tumors.

This course is not open to students who have credit for Pathology 135.

451. Pathology. Three credit hours. Winter Quarter. One lecture and six laboratory hours each week. Required. Prerequisite, Pathology 450. Mr. Scott, Mr. Van Buskirk.

A continuation of Pathology 450.

460. Pathology of the Eye. Three credit hours. Autumn Quarter. Lectures and recitations. Required. Prerequisites, Pathology 450, 451. Mr. Scott, Mr. Van Buskirk.

The gross and histological lesions involving the eye.

This course is not open to students who have credit for Pathology 141-142.

461. Pathology of the Eye. Three credit hours. Winter Quarter. Lectures, recitations, and laboratory. Required. Prerequisite, Pathology 460. Mr. Scott, Mr. Van Buskirk.

A continuation of Pathology 460.

PHYSICS

Office, 107 Physics Building

PROFESSORS COLE, EARHART, AND BLAKE, MR. WOODBURY, MR. JARVIS, MR. LOWRY

401. General Physics. Five credit hours. One Quarter. Autumn and Spring. Four recitations and one two-hour laboratory period each week. This course or Physics 403 required. Prerequisite, two units of high-school mathematics.

An introductory course in general physics.

This course is not open to students who have entrance credit for physics or credit for Physics 103.

402. General Physics. Five credit hours. One Quarter. Winter and Summer. Four recitations and one two-hour laboratory period each week. This course or Physics 404 required. Prerequisite, Physics 401.

An elementary course in general physics.

This course is not open to students who have entrance credit for physics or credit for Physics 104.

403. General Physics. Five credit hours. One Quarter. Autumn and Spring. Four recitations and lectures and one two-hour laboratory period each week. This course or Physics 401 required. Prerequisite, two entrance units in mathematics and one entrance unit in physics.

A course in general physics for students who have had physics in high school.

This course is not open to students who have credit for Physics 105 or 111.

404. General Physics. Five credit hours. One Quarter. Summer and Winter. Four lectures and recitations and one two-hour laboratory period each week. This course or Physics 402 required. Prerequisite, Physics 403.

A course in general physics for students who have had physics in high school.

This course is not open to students who have credit for Physics 106 or 125.

PHYSIOLOGY

Office, 104 Biological Building

PROFESSOR HOSKINS, ASSISTANT PROFESSOR McPEEK, AND DEPARTMENT ASSISTANTS

403. Physiology. Five credit hours. One Quarter. Autumn and Winter. Lectures and recitations. Required. Mr. Hoskins, Mr. McPeek.

The physiology of unicellular structures, muscle and nerve, central nervous system, autonomic system, external and internal senses, blood and heart. Reports of papers by students.

This course is not open to students who have credit for Physiology 127, 128.

404. Physiology. Five credit hours. One Quarter. Winter and Spring. Lectures and recitations. Required. Prerequisite, Physiology 403. Mr. Hoskins, Mr. McPeek.

The physiology of the circulatory and respiratory mechanisms, digestion, excretion, metabolism, etc.

440. Physiology of the Eye. Three credit hours. Autumn Quarter. Lectures and recitations. Required. Prerequisites, Physiology 403, 404. Mr. McPeek.

This course is not open to students who have credit for Physiology 161.

PSYCHOLOGY

Office, 403 University Hall

PROFESSORS ARPS AND WEISS, ASSISTANT PROFESSOR BURTT, AND DEPARTMENT ASSISTANTS

401. Elementary Psychology: Introductory Course. Five credit hours. One Quarter. Summer, Autumn, Winter, Spring. Required. All instructors.

A limited number of students may take 403 as equivalent to 401.

This course is not open to students who have credit for Psychology 101 or 103 or 105.

402. Elementary Psychology: Introductory Course. Five credit hours. One Quarter. Summer, Autumn, Winter, Spring. Required. Prerequisite, Psychology 401. All instructors.

This course is a continuation of Psychology 401.

This course is not open to students who have credit for Psychology 102 or 104.

403. Elementary Psychology. Five credit hours. One Quarter. Autumn and Spring. Elective. Mr. Weiss.

This course meets the same requirements as Psychology 401. Designed for students who wish to perform some of the simpler psycholog-

ical experiments in their elementary course. The registration is limited to forty students.

This course is not open to students who have credit for Psychology 103 or 101.

404. Elementary Psychology. Five credit hours. Winter Quarter. Four lectures and one laboratory period each week. Elective. Mr. Weiss.

This course is a continuation of Psychology 403 and meets the same requirements as Psychology 402.

This course is not open to students who have credit for Psychology 104 or 102.

601. Experimental Psychology: Introduction. Three credit hours. One Quarter. Autumn and Spring. One lecture and two laboratory periods each week. Elective. Prerequisite, Psychology 402 or 404. Mr. Weiss.

A systematic training course in the psychological methods as applied to the sense fields. Topics: vision; audition; the cutaneous, olfactory, gustatory, kinesthetic, and organic senses.

This course is not open to students who have credit for Psychology 111.

602. Experimental Psychology: Advanced. Three credit hours. Winter Quarter. One lecture and two laboratory periods each week. Elective. Prerequisite, Psychology 601. Mr. Weiss.

This course is a continuation of Psychology 601 and deals with more complex forms of behavior.

This course is not open to students who have credit for Psychology 112.